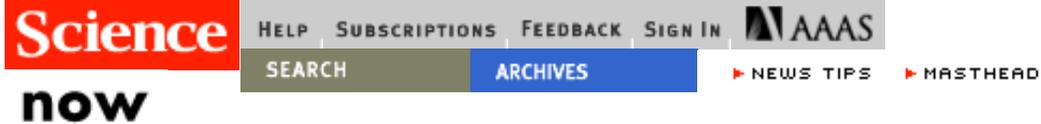




SCIENCE ONLINE | SCIENCE MAGAZINE | **SCIENCE NOW HOME** | NEXT WAVE | STKE/AIDS/SAGE | SCIENCE CAREERS

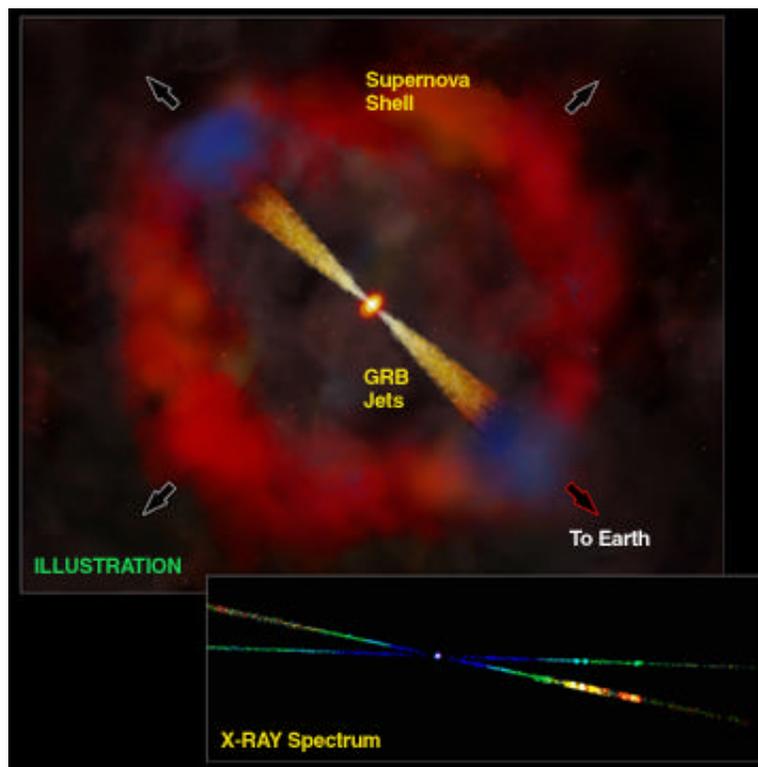
Subscriber: NASA GODDARD SPACE FLIGHT CTR | Sign In as Individual | **FAQ** | [Access Rights](#)
 Join AAAS



26 March 2003

A Gamma Ray Dispute Bursts Out

MOUNT TREMBLANT, QUEBEC--Astronomers claim that they have found the strongest signs yet that an ordinary supernova explosion can set the stage for a powerful gamma ray burst to erupt weeks or months later. But the study, announced here 24 March at a meeting of the American Astronomical Society's High-Energy Astrophysics Division, drew criticism from researchers who say the analysis is flawed.



Precursor? A Chandra x-ray spectrum (inset) suggests that radiation from a gamma ray burst lit up part of a shell from a previously exploded supernova.

CREDIT: CXC/M. WEISS (ILLUSTRATION); NASA/CXC/N. BUTLER

Most astrophysicists think that gamma ray bursts, fantastically energetic flares from deep space, stream from new black holes that form when the cores of massive spinning stars collapse to trigger supernovas. The black holes propel energy in fierce but short-lived jets, according to this "collapsar" model. A variant, dubbed the "supranova" scenario, maintains that a supernova first creates an unstable neutron star, which only later implodes into a black hole to make the burst. Some x-ray observations have hinted that space near gamma ray bursts contains heavy elements produced by earlier supernovas (*ScienceNOW*, [3 April 2002](#)). However, astrophysicists worried

ET AL. (SPECTRUM)
them unreliable.

that the low numbers of x-rays in these studies made

In the new work, **graduate student Nathaniel Butler** of the Massachusetts Institute of Technology in Cambridge and his colleagues used the Chandra X-ray Observatory to probe an August 2002 burst less than a day after it happened. The 21-hour exposure collected five times as many x-rays as any previous studies. Spectra of the burst revealed two distinct energy lines, **representing** enhanced x-ray emission from hot matter. The team **attributes the lines to excited** atoms of sulfur and silicon--two abundant products of supernovas. Details of the spectra suggest that the elements **glow within a narrow shell of material** ~~ripping~~ out from the site of the burst at one-tenth the speed of light. That jibes with a supernova detonating about 2 months before the gamma ray burst, **Butler says.** "I view this as the best evidence of the **supranova model,**" ~~says team member Donald Lamb,~~ an astrophysicist at the University of Chicago.

Others at the meeting weren't so sure. The team did not apply the proper statistical methods to rule out random fluctuations in the x-rays that can mimic spectral lines, says astrophysicist Masao Sako of the California Institute of Technology (Caltech) in Pasadena. **Moreover, the proposed time delay between** supernova and gamma ray burst is arbitrary and based on no plausible mechanism, says Caltech astrophysicist Andrew MacFadyen. "The simplest assumption is that this all happens when a single star dies," MacFadyen says. If shells of material do exist near bursts, they probably come from the massive stars themselves or from other supernovas popping off nearby, he adds.

--**ROBERT IRION**

Related sites

[Abstract of Butler *et al.* paper, with link to full text](#)

[Chandra X-ray Observatory](#)

[Primer on gamma ray bursts](#)

 [PAGE TOP](#)

[Previous Story](#) [ScienceNOW Home](#)

Copyright © 2003 by the American Association for the Advancement of Science.